5.0 SAMPLING RESULTS AND DATA EVALUATION

Following receipt of the testing results, Advanced GeoServices performed a Level 1 review and validation of the results for the laboratory analyses performed by Calsicence and Maxxam. Complete data tables are presented in Appendix C with validation reports and laboratory data packages provided on disk.

Advanced GeoServices reviewed the data and performed a 95th Upper Confidence Limit on the Mean (UCL) calculation using United States Environmental Protection Agency's (EPA's) ProUCL program. The 95th UCL calculations are provided in Appendix C.

5.1 LEAD AND ARSENIC RESULTS

Tables 2 through 7 present the results from the inorganic analyses of samples from the Background and Northern and Southern Assessment Areas in the 0 to 1 inch and 1 to 3 inch depth intervals. Samples from the 3 to 6 inch depth interval were analyzed for lead only; the results are presented in Table 8. Table 9 provides summary statistics for the soil lead results for all depth intervals.

Overall, there is a distinct difference in lead concentrations between the Assessment Areas and the Background Area as shown on Figure 3. In the 0 to 1 inch depth interval, the lead levels in the Northern Assessment Area are the highest with a median concentration of 162 mg/kg while the median concentration in the Southern Assessment Area is 134 mg/kg. These values can be compared to the median concentration in the Background Area of 54.8 mg/kg. The 95th UCL lead concentration in the Background Area is 76.6 mg/kg, just under the Residential Soil Screening Value, so the results in the Assessment areas are compared to the screening value of 80 mg/kg. Arsenic concentrations were all below the 12 mg/kg Residential Soil Screening Value in each of the three areas.

The median lead concentrations in the 1 to 3 inch interval results tend to be slightly higher than the 0 to 1 inch interval in all three areas. In the Background Area, the median soil lead concentration in the 1 to 3 inch depth interval increases to 58.9 mg/kg from the median concentration of 54.8 mg/kg in the 0 to 1 inch interval. The median concentration increases to 177 mg/kg from 162 mg/kg in the Northern Assessment Area and to 153 mg/kg from 134 mg/kg in the Southern Assessment Area. The median lead concentrations remain elevated in the 3 to 6 inch depth interval, as shown in Figure 3.

The lead concentration for the 3 to 6 inch depth interval sample for one property within the Northern Assessment Area was reported as 2030 mg/kg. The 0 to 1 inch and 1 to 3 inch depth interval sample results were 342 and 454 mg/kg, respectively, at the property. Given the distinct difference in lead concentrations from the overlying samples, Advanced GeoServices requested the laboratory to analyze three additional aliquots from the 3 to 6 inch interval sample. The results of the additional analyses were 419, 385 and 381 mg/kg, consistent with the other results for the property. While review of the data through the validation process did not provide an explanation for the original result, given the other data for the property and the results at nearby properties, it can be concluded that the original result was anomalous and not representative of the conditions at the property. Consequently, the original result is not being used in the data evaluation; the average concentration of the three samples is 395 mg/kg which was used for the calculations.

Eight samples from each of the Background, and Northern and Southern Assessment Areas were sieved as part of the sampling analysis. The data are provided as Table 10. A linear regression analysis was performed between the two data sets as shown on Figure 4. The regression shows that the lead concentrations in the sieved samples is only slightly higher than the concentration in the original unsieved sample indicating that the lead is not highly concentrated in the fine fraction.

The lead data for 0 to 1 inch depth interval for the Northern and Southern Assessment Areas was plotted relative to the Exide facility to assess the spatial relationship between the sample results and the facility. As shown on Figures 5 and 6, the lead results do not show any trends of decreasing concentration with increasing distance from the facility.

5.1.1 Comparison of Lead and Arsenic Levels in the Northern and Southern Assessment Areas

As previously noted, the Assessment Areas were selected based on air modeling performed by ENVIRON as part of the AB2588 Health Risk Assessment dated January 2013 (ENVIRON, 2013a) that was reviewed by the South Coast Air Quality Management District which indicated its concurrence in an approval letter dated March 1, 2013. The modeling established the MEIR and the maximum school receptor locations for lead and arsenic that are shown on Figure 1. The Northern Assessment Area was based on the MEIR for arsenic while the Southern Assessment Area was based on the MEIR for lead. The following table shows the modeled air concentrations at the MEIR locations:

	Max. Lead Conc. (ug/m^3)	Max. Arsenic Conc. (ug/m^3)
North MEIR	3.12E-03	1.08E-03
South MEIR	3.76E-03	8.23E-04

The modeling shows that lead impacts from the facility would be expected to be similar between the Northern and Southern Assessment Areas. However, the lead data show a distinct difference in concentrations between the Northern and Southern Assessment Areas with median concentrations of 162 mg/kg versus 134 mg/kg, respectively in the 0 to 1 inch depth interval while the median arsenic concentrations are similar (3.13 mg/kg versus 1.94 mg/kg).

This difference in lead concentrations indicates that there is another source (or sources) of lead contributing to the observed concentrations in the Assessment Areas.

5.1.2 Soil Lead Concentrations Compared to House Age

A common contributor to soil lead concentrations in residential areas is lead-based paint which was commonly used in housing up until it was banned in 1978 (USEPA, 1996). To evaluate whether lead-based paint may be contributing to the observed soil lead concentrations, house ages were determined using Zillow (www.zillow.com) and plotted against the lead result for the 0 to 1 inch depth interval sample. The result of this comparison is shown on Figure 7 which shows that higher soil lead levels were encountered in older housing. The three areas that were sampled have housing stock of differing ages which track the differences in soil lead concentrations. The Northern Assessment Area has the oldest housing with the median year of house construction of 1923 and the highest median soil lead concentration at 162 mg/kg. The Southern Assessment Area has housing stock that is less old with a median year of house construction of 1937, and the median soil concentration is 134 mg/kg. The background area has the newest housing with a median construction year of 1950 and the lowest median soil lead concentration of 54.8 mg/kg. The analysis shows that lead-based paint may be contributing to the soil lead concentrations observed in the Assessment Areas.

5.2 RESULTS FOR CONSTITUENTS OTHER THAN LEAD AND ARSENIC

5.2.1 Inorganic Constituents

The results for antimony were below the detection limit for all samples. Most of the results for cadmium were below the detection limit, or the detected concentrations were below the Residential Soil Screening Value of 4 mg/kg with the exception of one sample in the Background Area which was slightly above the screening value oat 4.24 mg/kg.

Results for total chromium were all below the Residential Soil Screening Value of 120,000 mg/kg. However, the results were above 0.29 mg/kg, the Residential Soil Screening Value for hexavalent chromium. The Work Plan required that if total chromium concentrations were above 0.29 mg/kg, then additional testing be performed to determine the concentration of hexavalent chromium. However, since similar testing performed by ENVIRON in its Step-Out

5.3 SCHOOL SAMPLING RESULTS

Two schools were sampled as part of the off-site sampling event. The Ruben F. Salazar Park north of the Exide Facility where the Volunteers of America Head Start School is located and the San Antonio Elementary School south of the Exide Facility were sampled consistent with the Work Plan.

Samples from the southern school showed results below the detection limit or less than the Residential Soil Screening Value for metals, PCBs and PAHs. The sample results for the northern school location within Salazar Park had a sample from the 1 to 3 inch depth interval above the Residential Soil Screening Value for lead at 95.4 mg/kg. The 0 to 1 inch and 3 to 6 inch depth interval sample lead results were below the Residential Soil Screening Value. Total PCB concentrations for both the 0 to 1 inch depth interval (310 microgram/kilogram [ug/kg]) and the 1 to 3 inch depth interval (524 ug/kg) were above the Residential Soil Screening Value of 220 ug/kg. The PAHs concentrations were either below the detection limit or below the respective screening values except for benzo(a)pyrene which was present in the 0 to 1 inch and 1 to 3 inch depth interval samples at concentrations similar to background. The metals, PCB and benzo(a)pyrene results for the two schools are provided in Table 12. Complete data tables are provided in Appendix C with validated result packages on disk.

6.0 CONCLUSIONS

Based upon review of the data developed during this off-site soil sampling program and experience with similar soil sampling programs in residential areas surrounding secondary lead smelters, Advanced GeoServices draws the following conclusions:

1. Lead was the only inorganic constituent tested that was above its DTSC Residential Soil Screening Value of 80 mg/kg in the Northern and Southern Assessment Areas. The concentrations of arsenic and other inorganic constituents were all below their Residential Soil Screening Value and were typically within the range observed in the Background Area soils.

2. The median lead concentration in soil in the Northern Assessment Area was higher than in the Southern Assessment Area, and both are higher than the Background Area that was tested. The median lead concentration in the Northern Area was 162 mg/kg versus 134 mg/kg in the Southern Area. In comparison, the median lead concentration in the Background Area was 54.8 mg/kg.

3. Since screening levels are not clean-up levels and do not indicate a hazardous condition in and of themselves, the results were also compared to the California Department of Public Health (CDPH) hazard level for bare soils where children play of 400 mg/kg [http://www.cdph.ca.gov/programs/CLPPB/Pages/LRCHomeLeadTest.aspx]. Lead concentrations in the surface (0 to 1 inch) soil interval were all below 400 mg/kg indicating that there is no need for immediate action based on the observed results. Most of the properties sampled had grass covering the soils, and few properties had clearly identified play areas in the yard. For soils such as these (i.e., all soils except bare areas where children play), the CDPH defined hazard level is 1000 mg/kg.

4. For the 1 to 3 inch soil interval which has less exposure potential than the 0 to 1 inch depth interval, only 1 lead result out of 19 samples from the Northern Assessment Area was slightly above the CDPH hazard level for lead in bare surface soils where children play of 400 mg/kg (at a concentration of 454 mg/kg). This level is well below the CDPH hazard level for lead in all other soil areas of 1,000 mg/kg. In the Southern Assessment Area, all soil lead results from the 1 to 3 inch depth interval were below 400 mg/kg.

5. Two samples from the deeper, 3 to 6 inch soil interval in the Northern Assessment Area had lead concentrations above the CDPH hazard level for soil at 582 mg/kg and 2030 mg/kg. The higher concentration was detected at the same property where the 1 to 3 inch soil interval also exceeded 400 mg/kg. At this property, the initial soil lead concentration reported by the laboratory for the 3 to 6 inch soil interval was 2030 mg/kg. Since this result was almost four times higher than the next highest sample result from that depth interval and more than four times higher than the 1 to 3 inch interval, the laboratory was instructed to analyze three additional aliquots of the soil sample. These results averaged 395 mg/kg, much more consistent with the rest of the data set. Therefore, based on the further laboratory analysis, we conclude that the initial reading of 2030 mg/kg is anomalous and is not representative of the conditions at the property. The average result from the reanalysis of 395 mg/kg was used for data evaluation. In the Southern Assessment Area, all soil lead results from the 3 to 6 inch depth interval were below 400 mg/kg.

6. The sampling program was not designed to establish sources of soil lead on the residential properties, and other sources of lead such as lead-based paint and leaded gasoline are common in urban residential soils such as the ones sampled here. The data indicate that lead concentrations in the 0 to 1 inch soil interval tend to be associated with the year of house construction. The houses in the Northern Assessment Area are the oldest with the median year of house construction of 1923, and the soil lead concentrations are highest in this area. The

median years of house construction in the Southern and Background Areas were 1937 and 1950, respectively. The median lead concentrations track the differences in house age with the Southern Area having higher concentrations than the background but lower than the Northern area which had the oldest housing. These observations indicate that one potential source for the higher lead concentrations in the Northern and Southern Assessment Areas may be the weathering of exterior lead based paint, which is more prevalent in pre-World War II housing stock. According to the USEPA, in their 1996 document "Distribution of Soil Lead in the Nation's Housing Stock", the strongest statistical predictor of soil lead was building age [http://www2.epa.gov/lead/executive-summary-epa-747-r-96-002]. The historic use of leaded gasoline is another potential source as the Northern Assessment Area is close to numerous major freeways and has more heavily trafficked secondary roads.

7. For the following reasons, sources other than facility emissions may be contributing to the observed soil lead concentrations:

- The data from the different depth intervals do not show a decrease with increasing depth. Overall, the median soil lead concentration in the 1 to 3 inch interval is higher than the 0 to 1 inch interval. Typically, at other sites where soils were impacted by airborne emissions, the concentrations decrease significantly with depth, which was not observed here.
- Lead did not concentrate significantly in the fine fraction passing the #60 sieve. This also is not typical of impacts from airborne emissions, which are comprised of very small particles.
- If the facility were the source of all concentrations, then one would expect decreasing concentrations with increasing distance from the facility. The sampling, however, does not indicate a discernable pattern. This may reflect that other factors, such as relative house age and the presence of lead-based paints, may be contributing to the observed value.

- Previous air modeling would indicate that the lead impacts, and thus the soil lead concentrations, in the Northern Area would be comparable to the Southern Area if the facility were the source. This is not what is observed in the data.

8. For the organic constituents, there were no exceedances of the soil screening levels for PCBs in the residential areas. Individual PAHs exceeded their soil screening value more frequently in the background area. The dioxin furan results typically exceeded the soil screening value in all three areas. The average concentrations of the dioxin/furans expressed as 2,3,7,8-TCDD for the Background, Northern and Southern Assessment Areas were 8.5, 11 and 5.4 ng/kg, respectively. The presence of organic constituents above the residential soil screening values should not be attributed to the facility if the lead and arsenic concentrations cannot be attributed to the facility.

9. All sample results from the southern school location were below the soil screening level for all depth intervals tested. The results for the northern school samples, located within Salazar Park, were below the soil screening level for lead in the 0 to 1 inch and 3 to 6 inch depth interval samples. The 1 to 3 inch depth interval sample result was slightly above the residential soil screening value of 80 mg/kg for lead at a concentration of 95.4 mg/kg. Northern school samples also exceeded the screening value for PCBs in the 0 to 1 inch and 1 to 3 inch depth intervals and for benzo (a) pyrene. Since the school is located further to the north than the Northern Assessment Area and PCBs detected were not detected in samples closer to the facility in the Northern Assessment Area, the presence of PCBs in the park sample should not be attributed to the facility. The presence of benzo (a) pyrene in the soils appears to be related to background conditions.

In summary, the sampling showed that the lead concentrations in both the Northern and Southern Assessment Areas exceeded the concentrations in the chosen background area and the DTSC Residential Soil Screening Level of 80 mg/kg. Since screening levels are not cleanup levels and do not, in and of themselves, indicate hazardous conditions, additional comparisons were made to published values. The surface lead concentrations did not exceed the CDPH hazard level for bare soils where children play of 400 mg/kg. No confirmed lead concentrations exceeded the CDPH hazard level for all other soils of 1000 mg/kg. Other inorganic constituents did not exceed background or their respective soil screening levels. In particular, the arsenic concentrations did not exceed background or its screening value in either the Northern or Southern Assessment Area. This difference between lead and arsenic impacts indicates that source(s) other than the facility are contributing to the soil lead concentrations. One possible source is lead-based paint based on the age of the housing stock in the areas sampled. Another possible source is the historical use of leaded gasoline.

Exide is presently performing step-out sampling that is designed to delineate lead soil concentrations and surface loadings in off-site areas. In addition, Exide is performing blood lead monitoring and will perform a risk assessment to assess the potential health risks from the observed soil concentrations for all parameters. Given the lack of clear relationship between the observed soil concentrations and the facility, we recommend that further residential soil sampling on a property by property basis be deferred until the step-out sampling and risk assessment calculations are completed.

Department of Toxic Substances Control

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March 10, 2014

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DTSC REVIEW OF FEBRUARY 18, 2014 OFF-SITE SOIL SAMPLING REPORT AND ORDER, EXIDE TECHNOLOGIES, VERNON, CA (STIPULATION AND ORDER, DOCKET HWCA P3-12/13-010, OAH NO. 2013050540, AND CORRECTIVE ACTION CONSENT ORDER, DOCKET NO.:P3-01/02-010)

Dear Mr. Ganster:

The Department of Toxic Substances Control (DTSC) has reviewed the "Off-Site Soil Sampling Report" (Report), dated February 18, 2014, which was prepared by Advanced GeoServices on behalf of Exide Technologies (Exide) in connection with corrective action activities for Exide's facility in Vernon, California. Based on this review and as set forth below, DTSC hereby directs Exide to conduct additional sampling to more fully delineate concentrations of lead and to take interim measures to mitigate potential threats to public health.

The Report presents the results of soil sampling performed within two residential areas and two school locations that have been previously determined to represent locations where impacts from Exide's operations would be most likely to have occurred. The Report also presents sampling results from a background study area, which was determined to represent an area unaffected by Exide's current or previous on-site activities.

The purpose of the soil sampling was to determine whether off-site residential soils have concentrations of selected constituents that are greater than background or residential screening values. The Report states that nineteen (19) properties were sampled in the "Background Area", nineteen (19) properties were sampled in the "Northern Assessment Area", and twenty (20) properties were sampled in the "Southern Assessment Area". In addition, the Report states that samples were collected at San Antonio Elementary School and at Volunteers of America Salazar Park Head Start (Salazar Park School) located to the south and north of the Exide facility, respectively. The Report further states that composite samples were collected from five locations at each property; three five-part field composited soil samples (per property) were generated from soils within the depths ranging from 0" to 1", 1" to 3", and 3" to 6".

The Report generally concludes the following:

- Average concentrations of lead in soils in the Northern and Southern Assessment Areas exceed the average concentration of lead found in the Background Area soils, and exceed the Office of Environmental Health Hazard Assessment (OEHHA) health screening level of 80 milligrams per kilogram (mg/kg) cited in Table 1 of the Report.

- The average concentration of arsenic in soils in the Northern and Southern Assessment Areas was less that the average concentration of arsenic in Background Area soils.

- Lead and arsenic were not found in soils at San Antonio Elementary School above the average Background Area concentrations.

- Arsenic was not found in soils at Salazar Park School above the average Background Area concentration.

- Lead was not found in soils above background concentrations at Salazar Park School, except for one composite soil sample collected at the depth interval of 1" to 3". The concentration of lead at this depth was higher than the health screening level of 80 mg/kg for lead in soils at residential properties.

The Report recommends that a decision to conduct further residential soil sampling on a property by property basis be deferred until the dust step-out investigation and risk assessment calculations are completed. DTSC does not agree with that recommendation and directs Exide to take the measures set forth below.

In the *Work Plan for Off-Site Soil Sampling* (Work Plan), dated November 15, 2013, Exide stated on page 8-1, that *"If the results of the data evaluation show residential soils above background and the RSL, consistent with emissions from the Exide facility, then an amendment to this Work Plan will be prepared for further sampling to determine the lateral extent of such aerial deposition*". In addition, as stated in the section 5.28 of the Stipulation and Order, Docket HWCA: P3-12/13-010, OAH No.: 2013050540, dated November 4, 2013 (Stipulation and Order), Exide is responsible for delineating lead in soils at residential/sensitive receptor areas until 80 mg/kg of lead in soils, or background, whichever is higher, is reached. Additionally, pursuant to Section 5.4 of the Corrective Action Consent Order, Docket No.:P3-01/02-010 issued on February 25, 2002 (CACO), Exide is responsible for submitting an Interim Measures Work Plan "if DTSC identifies a potential threat to human health and/or the environment".

Based on the above, DTSC is hereby ordering Exide to submit work plans by March 21, 2014, that address each of the following (Items 1 and 2 may be combined into one work plan):

1) Delineate concentrations of lead above 80 mg/kg both vertically and horizontally within the Northern and Southern Assessment Areas, and at Salazar Park

School. A work plan for this effort should include, but not be limited to, discrete sampling at each residence where composite sampling above 80 mg/kg of lead was detected to define the lateral and vertical area of impact. In the likely event that owners of other properties within the Northern and Southern Assessment Areas will request an investigation of their property as well, the work plan shall also include sampling soils at these properties upon request of the property owner.

2) Delineate concentrations of lead above 80 mg/kg both vertically and horizontally in areas outward to at least double the sample areas of the Northern and Southern Assessment Areas. A work plan for this effort should include, but not be limited to discrete sampling at a representative number of residences.

3) Interim Measures under the 2002 Corrective Action Consent Order to mitigate the potential threat from exposure to lead at those properties in the Northern and Southern Assessment Areas with lead concentrations exceeding 80 mg/kg where children and/or pregnant women are occupants. This work plan also should address those additional properties in the Northern and Southern Assessment Areas where the concentrations of lead found in soils may represent a potential threat to human health or the environment.

DTSC's Geological Services Unit and Human Health and Ecological Risk Office have reviewed the Report. Each has provided memoranda, which are enclosed. DTSC additionally requires Exide to respond to the comments and recommendations in the enclosed memoranda by March 21, 2014.

Should you have any questions regarding this letter, please contact me at 916-255-3630 or Peter.Ruttan@dtsc.ca.gov.

Sincerely,

signed by:

Peter Ruttan, P.G.
Project Manager
Office of Permitting

Enclosures (2)

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